

INFRARED SPECTRAL STUDIES OF SOME ESSENTIAL OILS
(Part I)

and

CANNABINOIDS : SOME ASPECTS OF THEIR CHEMISTRY
AND METABOLISM
(Part II)

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by

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To
My Parents

PREFACE

This dissertation consists of two parts. Part I contains infrared spectral studies of some essential oils which were carried out under the supervision of Dr. R.O.B. Wijesekera in the laboratories of the Natural Products Section, C.I.S.I.R., Colombo and Part II involves some aspects of the chemistry and metabolism of cannabinoids carried out under the supervision of Dr. Stig Agurell in the laboratories of the Institute of Pharmacognosy, Faculty of Pharmacy, Bio Medical Centre, University of Uppsala, Sweden. I am greatly indebted to both supervisors for their valuable advice and guidance rendered throughout the course of this work.

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Finally I wish to thank Mrs. Shirani Samaranayake for her skilful typing.

Most of the work appearing in this dissertation has been published in journals and presented at symposia, the details of which appear in page ii. Copies of the published papers appear in Appendices I to VI.

No part of the work presented here has been submitted earlier for a higher degree in this University or any other University or Institution.

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.....
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List of papers published from the work presented in this dissertation

(a) Papers published in journals

1. Essential Oils II.
Infrared spectroscopy in the analysis of the volatile oils of cinnamon.
R.O.B. Wijesekera and Kanthi H. Fonseka
J. National Science Council, Sri Lanka (1974), 2 (1), 35.
(Appendix I)
2. Essential Oils IV.
Recent studies on the volatile oils of cinnamon.
R.O.B. Wijesekera, A.L. Jayewardene, Lakshmi S. Rajapakse and Kanthi H. Fonseka
J. National Science Council, Sri Lanka (1975), 3 (2), 101.
(Appendix II)
3. Chromatographic separation of cannabinoids and their mono-oxygenated derivatives.
Kanthi Fonseka, Marianne Widman and Stig Agurell
J. Chromatog. (1976), 120, 343.
(Appendix III)
4. Cannabinoids : metabolites hydroxylated in the pentyl side chain.
S. Agurell, M. Binder, K. Fonseka, J.-E. Lindgren, K. Leander, B. Martin, I.M. Nilsson, M. Nordqvist, A. Ohlsson and M. Widman.
Marihuana : chemistry, biochemistry and cellular effects.
Ed. G.G. Nahas (1976)
Springer - Verlag New York Inc., (chapter 12), p 141.
(Appendix IV)
5. Dihydroxylated metabolites of cannabinol formed by rat liver in vitro.
Kanthi Fonseka and Marianne Widman,
J. Pharm. Pharmacol., (1977), 29, 12.
(Appendix V)

(b) Papers presented at Symposia

6. A new approach to the study of essential oils using infrared spectrometry.
R.O.B. Wijesekera and Kanthi H. Fonseka
Proc. Inst. Chem., Ceylon, 2nd Annual Sessions (1973), 41.
(Appendix VI)
7. Paper 2 was presented at the 6th International Congress of Essential oils, San Francisco, California, September 1974.
8. Paper 4 was presented at the 6th International Congress of Pharmacy and Pharmacology, Helsinki, Finland, July 1975.

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ABSTRACT

Part I

The chemical composition of essential oils of Sri Lanka Cinnamon leaf, Cinnamon stem bark, Cinnamon root bark and Clove bud have been examined qualitatively and quantitatively by the use of infrared spectroscopy. A comparative gas liquid chromatographic study has also been simultaneously carried out.

The applications of infrared spectroscopy to studies on essential oils is reviewed.

The work described illustrates the applicability of infrared methods for the quantitative analysis of essential oils.

Part II

Liquid (column), thin-layer and gas liquid chromatographic studies have been carried out on Δ^1 -tetrahydrocannabinol, Δ^6 -tetrahydrocannabinol, cannabinol, cannabidiol and on their monohydroxylated metabolites. Retention volumes (on Sephadex LH-20), thin-layer R_F values and gas liquid chromatographic retention times R_t were recorded which provide guidance in the separation and identification of these cannabinoids. Further, the above methods have been improved in order to obtain better resolution.

The metabolism of cannabinol in rat liver in vitro was studied. The isolation and purification of the metabolites was done

by liquid chromatography and preparative thin-layer chromatography. The structural elucidation was done by mass spectrometric and proton magnetic resonance spectrometric studies. Four new dihydroxy cannabinoids were isolated and these have been identified as 1",7-dihydroxycannabinol; 2",7-dihydroxycannabinol; 3",7-dihydroxycannabinol and 4",7-dihydroxycannabinol.